

APPENDIX H

ANALYSIS OF SPLIT-BALLOT AND QUESTION WORDING EXPERIMENTS

Question Wording Experiment on the Benefits and Harms of Genetic Engineering

Beginning with the 1981 *Science and Engineering Indicators* study, respondents have been asked to assess the relative harms and benefits of genetic engineering. Respondents have been asked the following question in previous studies:

Some persons have argued that **the creation of new life forms** through genetic engineering research constitutes a serious risk, while other persons have argued that this research may yield major benefits for society. In your opinion, have the benefits of genetic engineering research outweighed the harmful results, or have the **harmful** results of genetic engineering research been greater than its benefits?

In the 1997 *Science and Engineering Indicators* study, a question wording experiment was introduced regarding the relative harms and benefits of genetic engineering. respondents were randomly asked the traditional wording of the question, while the other half were asked the following question:

Some persons have argued that the **modification of existing life forms** through genetic engineering research constitutes a serious risk, while other persons have argued that this research may yield major benefits for society. In your opinion, have the benefits of genetic engineering research outweighed the harmful results, or have the harmful results of genetic engineering research been greater than its benefits?

All respondents indicating that the benefits outweigh the harms were asked, "Would you say that the balance has been strongly in favor of beneficial results, or only slightly?" Respondents indicating that the harms outweigh the benefits were asked, "Would you say that the balance has been strongly in favor of harmful results or only slightly?"

Table 2 below displays the distribution of responses to these questions based on the question wording presented. There was no significant difference in an assessment of the harms and benefits of genetic engineering based on the question wording in 1997 ($X^2=6.3$; d.f.=4; $p=.18$). However, in 1999 there was a significant difference in responses ($X^2=27.9$; d.f.=4; $p=.00$). Even when the responses are collapsed into three categories (benefits greater, no difference, and harms greater), there is still a significant difference based on question wording.

In 1999, respondents who were asked about the "modification of existing life forms" had a more favorable assessment of genetic engineering than did those who were asked about the "creation of new life forms." In 1997, 41 percent of those who were asked about the creation of new life forms and 44 percent who were asked about the modification of existing life forms said that the benefits were greater than the harms. In contrast, in 1999, 39 percent of those who were asked about the creation of new life forms and 49 percent of those who were asked about the modification of existing life forms thought that the benefits were greater than the harms.

Table 2: Question Wording Experiment on the Harms and Benefits of Genetic Engineering, 1997 and 1999.

	B>>H	B>H	B=H	H>B	H>>B	Number
	Percent					
1997:						
Creation new life forms	18%	23%	21%	21%	17%	984
Modification existing life forms	20	24	23	18	15	1,015
$X^2 = 6.3$; d.f.=4; p=.18						
1999:						
Creation new life forms	19	20	20	22	19	930
Modification existing life forms	21	28	17	21	13	952
$X^2=27.9$; d.f.=4; p=.00						

Question Order Experiment on the Use of Animals in Scientific Research

Since 1988 the *Science and Engineering Indicators* studies have included a single question designed to measure the public's attitudes toward the use of animals in scientific research. Respondents have been asked:

Scientists should be allowed to do research that causes pain and injury to animals like dogs and chimpanzees if it produces new information about human health problems. Do you strongly agree, agree, disagree, or strongly disagree?

The 1999 study included the traditional question, and also introduced the following question regarding the use of mice in scientific research:

Scientists should be allowed to do research that causes pain and injury to animals like mice if it produces new information about human health problems. Do you strongly agree, agree, disagree, or strongly disagree?

Respondents were randomly assigned to two different question-order conditions. Half of the respondents were asked about dogs and chimpanzees then after nine additional attitudinal questions (not related to animal research) about mice. The other half of the respondents were first asked about mice then after the same nine additional attitudinal questions were asked about dogs and chimpanzees.

There was a significant difference in attitudes about the use of dogs and chimpanzees in scientific research based on the order in which the questions were presented ($X^2=11.8$, d.f.=4; $p=.019$). Respondents who were first presented the questions about dogs and chimpanzees were more likely to strongly disagree with the statement about dogs and chimpanzees than were those who were first presented with the statement about mice (see Table 3). However, when the responses are collapsed into agree, disagree, and uncertain, there is no significant difference in responses based on question order.

There was also a significant difference in attitudes about the use of mice in scientific research based on the order in which the questions were presented ($X^2=40.0$; d.f.=4; $p=.000$), with the differences being primarily in the intensity of the opposition. Seventeen percent of those first presented with the question about mice strongly agreed with the use of mice in research, compared to only 10 percent of those first presented with the question about chimpanzees (see Table 4). When the responses are collapsed into agree, disagree, and uncertain, there is no significant difference based on question order.

Table 3: Question Order Experiment on the Use of Dogs and Chimpanzees in Scientific Research, 1997 and 1999

	SA	A	U	D	SD	Number
1997:						
Chimps first	7%	39%	3%	33%	18%	996
Mice first	7	40	6	34	13	1,004
$X^2=11.8; d.f.=4; p=.019$						
1999:						
Chimps first	7	43	3	30	17	904
Mice first	5	41	4	39	11	977
$X^2=27.9; d.f.=4; p=.000$						

Table 4: Question Order Experiment on the Use of Mice in Scientific Research

	SA	A	U	D	SD	Number
1997:						
Chimps first	10%	59%	2%	24%	5%	996
Mice first	17	51	3	20	9	1,004
$X^2=40.0; d.f.=4; p=.000$						
1999:						
Chimps first	7	62	2	23	6	904
Mice first	13	58	3	20	6	978
$X^2=21.3; d.f.=4; p=.000$						